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Transport of Freshwater Across the Shallow Southeast Vietnamese Continental Shelf and Slope

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LONG-TERM GOALS

The long-term goal of this project is to understand the dynamics of shelfbreak processes in the South China Sea with particular emphasis on cross-shelf exchange, scales of variability, and the effects of monsoonal forcing on exchange.

OBJECTIVES

The specific objectives for this project were to perform two research cruises during the winter and summer monsoons and do repeated hydrography with a towed vehicle to measure fluxes across the shelfbreak in the South China Sea. We also planned to deploy two moorings to examine temporal variability of cross-shelf flows.

APPROACH

The approach was to participate in joint cruises with other researchers including Taiwanese colleagues. During the past year the geographical focus shifted from the Vietnamese shelf and slope to the area to the southwest of Taiwan and planning was shifted accordingly.

WORK COMPLETED

We participated in the R/V Roger Revelle cruise off Taiwan in May, 2013. We deployed two moorings at the 100 m and 300 m isobaths, and also participated in hydrographic operations.

RESULTS

The moorings were deployed for a period of roughly 5 weeks. Despite being an area of high fishing activity and transit lanes for commercial shipping, the moorings survived the deployment and were recovered with nearly all the sensors reporting high quality results.

The most significant finding was the presence of an increasing low-frequency flow to the northeast over the continental shelf which reached as high as 60 cm/s at the time of mooring recovery (Figure 1). This was surprising as prior mooring deployments during the ASIAEX experiment had indicated very weak flows over the outer continental shelf. Shipboard ADCP measurements suggest that there was a strong anti-cyclonic flow in the deep waters to the southwest of Taiwan during the observational period, which lasted for several months (Figure 2). Preliminary indications are that this flow translated to the west and across the continental shelf, indicating an important role in offshore forcing for the generation of (months long) low-frequency flows over the outer continental shelf in the South China Sea.

IMPACT/APPLICATIONS

These results are important for understanding flows near the shelfbreak in the South China Sea. The onshore penetration to the 100 m isobath of strong anti-cyclonic flows has important ramifications for understanding acoustic propagation of sound in this area. These results will improve our understanding of the effects of stratification on flow-topography interactions in the region. While we have not analyzed the mooring data fully, we also sampled at high frequency in order to resolve internal wave motions at sites away from the main beam of tidal energy moving westward from Luzon Strait. This should help further understanding of local generation of non-linear internal waves near the shelfbreak away from the energetic trans-basin waves.

RELATED PROJECTS

This project is related to the recently completed DRI on Quantifying, Predicting, and Exploiting Uncertainty which studied shelfbreak processes northeast of Taiwan in the East China Sea.

HONORS/AWARDS/PRIZES

G. Gawarkiewicz was chosen to present the keynote address at the Taiwan Geophysical Assembly in Taoyuan, Taiwan, in May, 2013.